

CLAIMS:

- 1) Thermosetting binder compositions for powder coatings comprising a linear or
5 branched carboxylic acid group containing isophthalic acid rich polyester, a
linear or branched hydroxyl group containing polyester and a curing agent
system having functional groups reactive with the polyester carboxylic acid
groups and the hydroxyl groups, characterised in that the carboxylic group
containing isophthalic acid rich polyester is amorphous and the hydroxyl group
containing polyester is semi-crystalline.
- 10 2) Binder compositions according to claim 1, characterised in that the curing
agent system is composed of at least one curing agent having functional groups
reactive with the polyester carboxylic acid groups and at least one curing agent
having functional groups reactive with the polyester hydroxyl groups, and/or at
least one curing agent having functional groups reactive with both the polyester
15 carboxylic acid groups and the polyester hydroxyl groups.
- 3) Binder composition according to anyone of the claims 1 and 2, characterised in
that the carboxylic acid group containing amorphous polyester is composed of a
dicarboxylic acid component comprising 50 to 100 mol percentage of
isophthalic acid and from 0 to 50 mol percentage of another diacid selected
20 from fumaric acid, maleic acid, phthalic anhydride, terephthalic acid,
1,4-cyclohexanedicarboxylic acid, 1,3-cyclohexanedicarboxylic acid, 1,2-
cyclohexanedicarboxylic acid, succinic acid, adipic acid, glutaric acid, pimelic
acid, suberic acid, azelaic acid, sebacic acid, 1,12-dodecanedioic acid, etc., or
the corresponding anhydrides., and of a glycol component comprising 70 to 100
25 mol percentage of neopentyl glycol and/or 2-butyl- 2-ethyl - 1,3-propanediol
and 0 to 30 mol percentage of another glycol selected from ethyleneglycol,
propyleneglycol, 1,4-butanediol, 1,6-hexanediol, 1,4-cyclohexanediol,
1,4-cyclohexanedimethanol, 2-methyl 1,3-, hydrogenated Bisphenol A,
hydroxypivalate of neopentyl glycol.
- 30 4) Binder composition according to anyone of the claims 1-3, characterised in that
the carboxylic acid group containing amorphous polyester is a branched
polyester incorporating up to 15 mol percentage relative to isophthalic acid, of a
polyacid such as trimellitic acid, pyromellitic acid, etc, or their corresponding
anhydrides.
- 35 5) Binder composition according to anyone of claims 1-3, characterised in that the
carboxylic acid group containing amorphous polyester is a branched polyester

incorporating up to 15 mol percentage relative to neopentyl glycol and/or 2-butyl-2-ethyl-1,3-propanediol, of a polyol such as trimethylolpropane, ditrimethylolpropane, pentaerythritol.

- 6) Binder composition according to anyone of the preceeding claims,
5 characterised in that the hydroxyl functionalised semi-crystalline polyester is composed of 75 - 100 mol percentage of terephthalic acid and/or 1,4-cyclohexanedicarboxylic acid and from 0 to 25 mol percentage of another diacid selected from fumaric acid, maleic acid, phthalic anhydride, isophthalic acid, terephthalic acid, 1,4 cyclohexanedicarboxylic acid, 1,3-cyclohexanedicarboxylic
10 acid, 1,2-cyclohexane dicarboxylic acid, succinic acid, adipic acid, glutaric acid, pimelic acid, suberic acid, azealic acid, sebacic acid, 1,12-dodecanedioic acid, etc., and of a glycol component comprising from 75 to 100 mol percentage of an aliphatic non-branched diol selected from ethyleneglycol, 1,3-propanediol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 1,7-heptanediol, 1,8-octanediol,
15 1,9-nonanediol, 1,10-decanediol, 14-tetradecanediol, 1,16-hexadecanediol, etc. used in a mixture or alone, and 0 to 25 mol percentage of another glycol selected from propyleneglycol, neopentyl glycol, 2-methyl-1,3-propanediol, 2-butyl,2-ethyl-1,3-propanediol, hydrogenated Bisphenol A, hydroxypivalate of neopentyl glycol, 1,4-cyclohexanediol, 1,4-cyclohexanedimethanol.
- 20 7) Binder composition according to anyone of claims 1-5, characterised in that the hydroxyl functionalised semi-crystalline polyester is composed of 75 - 100 mol percentage of a linear non-branched aliphatic diacid selected from succinic acid, adipic acid, glutaric acid, pimelic acid, suberic acid, azealic acid, sebacic acid, 1,12-dodecanedioic acid, etc. used in a mixture or alone, and from 0 to 25
25 mol percentage of another diacid selected from fumaric acid, maleic acid, phthalic anhydride, terephthalic acid, isophthalic acid, 1,2-cyclohexanedicarboxylic acid, 1,3-cyclohexanedicarboxylic acid, 1,4-cyclohexanedicarboxylic acid, etc., and of a glycol component comprising from 75 to 100 mol percentage of a cycloaliphatic diol such as
30 1,4-cyclohexanediol, 1,4-cyclohexanedimethanol, hydrogenated Bisphenol A, etc. used in a mixture or alone, or an aliphatic non-branched diol such as ethyleneglycol, 1,3-propanediol, 1,4-butanediol, 1,5-pentanediol, 1,6 hexanediol, 1,7-heptanediol, 1,8-octanediol, 1,9-nonanediol, 1,10-decanediol, 14-tetradecanediol, 1,16-hexadecanediol, etc. used in a mixture or alone, and
35 from 0 to 25 mol percentage of another glycol selected from propyleneglycol,

- neopentyl glycol, 2-methyl-1,3-, 2-butyl, 2-ethyl-1,3-propanediol, 1,4-cyclohexanediol, 1,4 cyclohexanedimethanol, hydrogenated Bisphenol A.
- 8) Binder composition according to anyone of claims 1-5, characterised in that the hydroxyl functionalised semi-crystalline polyester is a branched polyester incorporating up to 15 mol percentage based on the total of terephthalic acid, 1,4-cyclohexanedicarboxylic acid or non-branched aliphatic diacids, of a polyacid such as trimellitic acid, pyromellitic acid, etc., or their corresponding anhydrides.
- 9) Binder composition according to anyone of claims 1-5, characterised in that the hydroxyl functionalised semi-crystalline polyester is a branched polyester incorporating up to 15 mol percentage based on the total of aliphatic non-branched diols or cycloaliphatic diols, of a polyol such as trimethylolpropane, ditrimethylolpropane, pentaerythritol.
- 10) Binder composition according to anyone of claims 1-5, characterised in that the hydroxyl functionalised semi-crystalline polyester is a branched polyester incorporating up to 30 mol percentage based on the total of terephthalic acid, 1,4-cyclohexanedicarboxylic acid or non-branched aliphatic diacids and/or on the total of aliphatic non-branched diols or cycloaliphatic diols, of monofunctional carboxylic acids having at least two hydroxyl groups wherein one or more of the hydroxyl groups can be hydroxyalkyl substituted, selected from α,α -bis-(hydroxymethyl)-propionic acid (dimethylolpropionic acid), α,α -bis-(hydroxymethyl)-butyric acid, α,α,α -tris(hydroxymethyl)-acetic acid, α,α -bis-(hydroxymethyl)-valeric acid, α,α -bis-(hydroxy) propionic acid or α -phenylcarboxylic acids having at least two hydroxyl groups directly pendant to the phenyl ring (phenolic hydroxyl groups) such as 3,5-dihydroxybenzoic acid.
- 11) Binder composition according to anyone of the preceeding claims, characterised in that the carboxylic acid group containing isophthalic acid rich amorphous polyester has:
- an acid number from 15 to 100 mg KOH/g and preferably from 30 to 70 mg KOH/g;
 - a number averaged molecular weight ranging from 1100 to 15000 and preferably from 1600 to 8500;
 - a glass transition temperature (Tg) from 40 to 80°C ; and
 - an ICI (cone/plate) viscosity at 200°C ranging from 5 to 15000 mPa.s

- 12) Binder composition according to anyone of the preceeding claims, characterised in that the hydroxyl group containing semi-crystalline polyester has:
- an hydroxyl number from 10 to 100 mg KOH/g and preferably from 15 to 80 mg KOH/g;
 - 5 • a number averaged molecular weight ranging from 1100 to 17000 and preferably from 1400 to 11200;
 - a fusion zone from 50 to 150°C;
 - a glass transition temperature (Tg) from -50 to 50°C;
 - a degree of crystallinity of at least 5 J/g and preferably 10J/g; and
 - 10 • an ICI (cone/plate) viscosity at 175°C ranging from 5 to 10000 mPa.s
- 13) Binder composition according to anyone of the preceeding claims, characterised in that the thermosetting polyester blend is composed of :
- 55 to 95 and preferably 70 to 90 parts by weight of the carboxylic acid group containing isophthalic acid rich amorphous polyester; and
 - 15 • 45 to 5 and preferably 30 to 10 parts by weight of the hydroxyl group containing semi-crystalline polyester.
- 14) Binder composition according to anyone of the preceeding claims, characterised in that the curing agent having functional groups reactive with the carboxylic acid groups of the isophthalic acid rich amorphous polyester, is a polyepoxy compound or a β -hydroxyalkylamide containing compound.
- 20 15) Binder composition according to anyone of the preceeding claims, characterised in that the curing agent having functional groups reactive with the hydroxyl groups of the semi-crystalline polyester, is a blocked polyisocyanate compound.
- 16) Binder composition according to anyone of the preceeding claims, characterised in that the carboxylic acid group containing amorphous polyester comprises a catalysing amount of thermosetting catalyst ranging from 0 to 5 weight percentage.
- 25 17) Binder composition according to anyone of the preceeding claims, characterised in that the hydroxyl group containing semi-crystalline polyester comprises a catalysing amount of thermosetting catalyst ranging from 0 to 5 weight percentage.
- 30 18) Binder composition according to anyone of the preceeding claims, characterised in that the binder is substantially based on:
- 28 to 93, preferably 43 to 86 parts by weight of the carboxylic acid group containing isophthalic acid rich amorphous polyester
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- 43 to 3, preferably 29 to 7 parts by weight of the hydroxyl group containing semi-crystalline polyester
 - 1 to 45, preferably 3 to 35 parts by weight of a curing agent having functional groups being reactive with the carboxylic acid groups of the amorphous polyester
 - 21.0 to 0.1, preferably 9.0 to 0.5 parts by weight of a curing agent having functional groups reactive with the hydroxyl groups of the semi-crystalline polyester.
- 19) Thermosetting powder composition containing:
- a binder composition according to anyone of the preceeding claims
 - UV-light absorbers and/or hindered amine light stabilisers
 - flow control agent
 - degassing agent.
- 20) Thermosetting powder composition according to claim 19 for use as a clear lacquer.
- 21) Thermosetting powder composition according to claim 19 containing pigments, dyes, fillers.
- 22) Entirely or partially coated substrate, characterised in that the coating material used, is a powder coating composition according to anyone of claims 19 to 21.